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PSYCHOLOGY

Tests Show Effect of Noise on Nerves

By Emily C. Davis

Jing-ng-ng-ng, goes the telephone. Rattle, rattle, rattle go the typewriters. Br-r-r-r-r (magnified 100 or so times) —that's the roar of traffic in the street below. Squeeeeek—as the cars slow down near the corner. A shrill indescribable toot is the siren of an automobile in a hurry.

"Where's that telegram from Williams?"

"I don't know. Look in the files."

"And he said to me—"

Conversation isn't so noisy, but it distracts a worker. Or doesn't it?

What do such noises do to the mind and body of individuals?

In the opinion of Thomas Edison, noise is bound to increase, in cities at any rate, and he foresees that the city dweller will adapt himself to the situation by becoming comfortably deaf, just deaf enough not to care. But Mr. Edison takes a long view of the situation.

Scientists in the meantime are beginning to measure the exact effect of noises on a worker's speed and accuracy, on his energy output, and on his nerves.

A twelve-day experiment showing what noise does to a good typist has just been completed by Dr. Donald Laird and his assistants in the psychological laboratory at Colgate University. For five years Dr. Laird has been conducting investigations to measure the human energy that is used up in various kinds of mental work. He has studied causes of fatigue and ways of stalling off the weariness that comes from using up too much energy in a job that might be much more simply done. He has looked around offices and factories and shown ways in which environment can make a huge difference in an individual's efficiency, and in the wear and tear on his body machinery.

In this latest test, Dr. Laird determined to measure the differences between typing in a room where noises reverberate from ordinary brick walls and typing in a room with walls which deaden the thundering echoes and vibrations.

The typist of the experiment was Miss Elsie Keller, a young woman who finds turning out 100 words a minute a comfortable speed, and who can do 158 a minute if the boss is in a hurry.

Each week-day for two weeks Miss Keller sat in Dr. Laird's laboratory and typed the same letter over and over for two hours, without a stop, while the staff of experimenters watched the apparatus of the experiment and took notes and made computations.

Miss Keller went into a special kind of training for this psychological investigation. For two weeks she dedicated all of her energy to the experiment. She did no walking except to enter a taxicab at her house and to walk from the taxi into the laboratory. Each morning she ate a standard breakfast. Each morning she was weighed in, like a prize fighter, to find out whether her weight was changing during the typing ordeal.

Before she started rattling out letters she was asked each day to sit quietly at rest in the laboratory for half an hour. This enabled the scientists to measure the rate at which her body expends its energy at approximately its lowest waking level.

Then, she seated herself before a noiseless typewriter, while the laboratory men prepared to turn on the noise. This important part of the experiment was furnished by an electrically run machine. The versatile noise machine was prepared to produce a steady hum like the din of traffic. It would ring a telephone bell at irregular intervals. It sounded a shrill automobile horn from time to time. Sometimes the whirr of office machinery was added to its assortment of sounds. Conversation was about the only noise left out of the

(*Just turn the page*)

NO GUM CHEWING FOR THIS TYPIST. The gas mask helps in measuring the amount of energy she uses, while the psychologist with the stop watch keeps up with her speed

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Noise and Nerves

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machine's repertoire, and this was supplied by a phonograph which ground out a recitation occasionally on request.

This machine saw to it that throughout the two-hour stretches of typing, one noise or another was constantly banging at Miss Keller's ears. Though even at the worst, Dr. Laird says, the noise was no greater than in many offices and not so bad as in some offices.

When the noises were turned on about five feet away from her, and a rubber mask was fitted over her nose and mouth to collect her breath, the typist was ready for work.

During the first three days she worked in a room in which the sound was partially absorbed by wall coverings, so that they did not re-echo through the room in prolonged vibrations. In these circumstances, the noise machine did not disturb her, the typist reported, except for the shrill auto siren which caused her to make mistakes when it blared in her ears.

On the fourth day, the experiment was changed to a laboratory with brick walls, where the noises could reverberate and each sound wave echoed undisturbed, so that the effect piled up and each noise seemed to be multiplied.

Here the typist declared that she was still not consciously disturbed by office noises. The telephone bell, and the sounds like typewriters and mimeographs were accustomed racket, and did not seem to distract her. The automobile horn, on the other hand, continued to annoy her, and mistakes followed its alarming sound.

Dr. Laird and his associates, meanwhile, were making their measurements. These showed that a human being's report of how he feels is not the most accurate gauge of the state of his own mechanism, in spite of the fact that he has inside information.

In the pile of neatly typed letters

(*Continued on page* 227)

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ASTRONOMY

Comet Returns For Visit

The Grigg-Skjellerup comet, found in the constellation of Orion on March 30 by Dr. George Van Biesbroeck of the Yerkes Observatory in Wisconsin, was seen earlier by European astronomers, according to information reaching the Harvard Observatory from the International Bureau of Astronomical Telegrams at Copenhagen. On March 27, James Hargreaves and Gerald Merton, of the British Royal Observatory at Greenwich, picked it up with one of the large telescopes, while on March 21, E. Delporte, at the Royal Belgian Observatory at Uccle, observed it.

When the earlier observations were made, however, it was not quite certain that they were of the Grigg-Skjellerup comet. The object seen was close to the position predicted, but it sometimes happens that an entirely unknown comet reappears near the position that another on a return is expected to occupy. The careful search of part of the sky for the returning visitor may reveal another that would otherwise have been missed. However, after three observations have been made of a comet, it is possible to calculate its orbit, and thus definitely determine whether it is a periodic comet returning, or a new one appearing for the first time.

Now it has been ascertained that this comet is actually the same one, which returns to the neighborhood of the earth once in about five years. It was first located by Grigg in 1902, but was lost until 1922 when J. F. Skejellerup, an Australian astronomer, found it again on May 6, and so both discoverer's names were attached to it. When observed by Prof. Van Biesbroeck, its position, expressed astronomically, its position when discovered was right ascension 5 hours 50 minutes and 48.4 seconds, and declinations 3 degrees 7 minutes and 30 seconds south. This is in the constellation of Orion, now in the southwestern sky early in the evening. The comet was just east of the familiar "belt," the three bright stars in the constellation. However, as it was of the fifteenth magnitude, it is far too faint to be seen with the naked eye.

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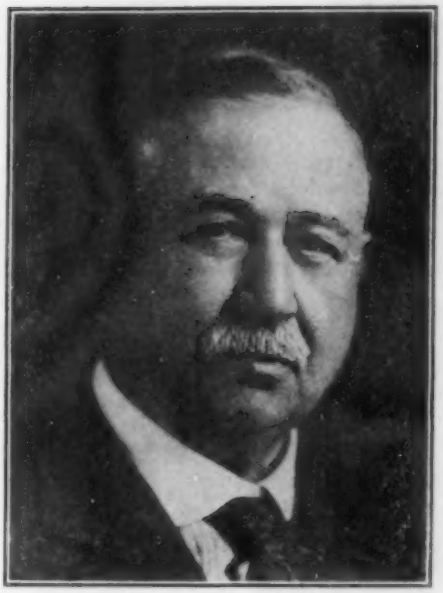
Within ten minutes after a camera in an airplane had taken a picture, in Indiana, it was finished and dropped by parachute to the ground.

MEDICINE



VICTOR C. VAUGHAN

Physician And Philosopher

Dr. Vaughan is the worthy successor of that long line of humanist-physicians which includes Sir Thomas Browne, Sir William Osler and Silas Weir Mitchell. His big three-decker textbook on "Epidemiology and Public Health" is the leading and latest authority on that subject. His administrative and constructive ability is evidenced by his building up in the country town of Ann Arbor a great school of medicine, sought by students from all over the world. Few teachers have influenced so many thousands of young men and women in their professional training, and still fewer have been regarded with such personal affection throughout their subsequent career. He was Dean of the Department of Medicine and Surgery of the University of Michigan from 1891 till 1921 when he resigned at the age of seventy, and went to live in Washington.

But he did not retire from work when he retired from collegiate duties, for he has since taken an active part in the development of the National Research Council which was founded during the Great War as the agency through which the National Academy of Sciences could give technical aid and advice to the Government. Here his wide knowledge of epidemics was particularly needed for the rapid assembling of recruits from all parts of the country without quarantine or change of civilian clothes brought into the concentration camps the germs of all current diseases. As Dr. Vaughan

(Just turn the page)

ARCHÆOLOGY

Roman Wall Mystery

The famous stone wall of Hadrian, built by Roman soldiers 1800 years ago to divide the north half of Great Britain from the south, may at last be completely understood. In a lecture before the Royal Institution, Sir George Macdonald pointed out that the dramatic discovery of a strip of turf wall joined to the great stone wall and ending beneath it reveals a missing chapter in the wall's history.

A stretch of turf wall found in 1895, several miles west of the new strip, had only added to the complexity of the Hadrian Wall riddle, but after this second discovery scientists will now seek for further traces of what appears to have been an earlier barricade across this strategic battle ground of ancient Britain.

The accepted story, so far pieced together, of how Hadrian's wall came to be built begins in the first century A.D. when a string of forts were constructed across this part of the country by the Romans who were trying to Romanize the Britons. About this time, or a little later, an earth embankment was thrown up across the country south of the forts, making a legal boundary dividing north from south.

In the second century A.D. a great stone wall 20 feet high, eight feet wide, was stretched across England, parallel with the embankment for 73 miles, from coast to coast. This was the famous wall now named for the emperor Hadrian, and generally believed to have been constructed by him, while to the Emperor Severus who came a little later is given credit for making elaborate restorations of the great wall. It is this puzzling point in the wall's history that the turf wall find may clear. Perhaps Hadrian built the turf wall and Severus the stone wall itself. Sir George pointed out that further digging is necessary before theorizing will be profitable.

The great wall was the scene of heavy fighting in the first centuries of our era. When the boundary ceased to be a battle ground, the wall served for centuries as an inexhaustible quarry for building stones, which fact has increased the difficulty of restoring the wall and tracing its plan.

"Two or three centuries ago, on the strength of the material that had

(Just turn the page)

Wall Mystery

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accumulated," said the speaker, "students of the subject were beginning to feel that it was now possible to formulate a complete and coherent theory which would explain all the phenomena satisfactorily. But they had reckoned without their host. The Spirit of the Wall had a fresh surprise in store.

"In 1895, Prof. Haverfield and his colleagues had discovered at Appletree a long stretch of wall built, not of stone, but of turf, abutting at either end of the wall proper, with which it did not seem otherwise to be organically connected. At first it looked as if the turf wall were going to provide a new unexpected way of reconciling the rival claims of Hadrian and Severus. Presently that possibility was conclusively disproved and there followed a disposition to leave the turf wall out of account or to relegate it to the limbo of unsolved and insoluble riddles.

"In 1925, however, it, or another turf wall, made a dramatic reappearance six or seven miles farther east at Aesica, this time on the north of the stone wall and ultimately beneath it. That is how matters stand. The key will probably be found at Birdoswald."

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A recent Canadian survey showed that nearly half of all electrical fires are due to misuse of the electric pressing iron.

Sweet corn should be eaten soon after it is pulled, as over half the sugar turns to starch within 24 hours after the ear is taken from the stalk.

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Physician and Philosopher

(*Continued from page 223*)

says in "A Doctor's Memories," his recently published autobiography, "The most insane procedure carried out in 1918, from the standpoint of an epidemiologist, was the sudden and complete mobilization of the students in our universities in the Students' Training Corps. How many lives this procedure sacrificed I can not estimate." But when the danger of such disregard of sanitary science was pointed out in advance to the proper authorities the answer was: "The purpose of mobilization is to convert civilians into trained soldiers as quickly as possible and not to make a demonstration in preventive medicine."

On the program of the American Chemical Society meeting in Richmond on April 12, Dr. Vaughan is listed for an address on "A Chemical Concept of the Origin and Development of Life." This is the culmination of a line of thought and experimentation which he has pursued for many years and which has led him to the conclusion that "life is molecular, not cellular."

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Do You Know That—

Camphor is used in making celluloid.

Very large trees can now be transplanted.

Almost 150 uses have been found for peanuts.

Einstein's theory of relativity is 21 years old.

There is no satisfactory way to remove freckles.

The scent of a flower is due to volatile oils in the plant.

There are 100 flashes of lightning somewhere every second.

The Russian government made coins out of platinum in 1828.

When a fly eats sugar it spits on it and sucks the sweet solution.

Airplane pictures taken obliqely show the ground in perspective.

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BOTANY

City Trees Have Hard Life

By Dr. Haven Metcalf

Dr. Metcalf is in charge of the work of the Bureau of Plant Industry of the U. S. Department of Agriculture in the study of tree diseases

Tree-planting time is upon us. In suburbs and residence towns, wherever there are new streets hopeful landowners are setting out young shade trees by the mile, while city foresters face the harder problem of finding green warriors against the hard conditions man has created in the brick-paved deserts he chooses to live in.

When one considers what the average street tree is up against it is really a wonder that we have any of them left. As a matter of fact, all that we have left are the tough ones, and there is much to indicate that in the modern paved city, most of these will be short lived. When growing under natural conditions a tree has unpolluted air, soil that is not only unpaved and untrodden, but deep, soft, and annually enriched by the deposit of dead leaves. You know how black and rich the top soil is in the forest. A street tree, on the other hand, has its leaves choked by smoke. If you doubt this, take a leaf from some street tree some day when there has been no recent rain and rub it on your cuff.

But it is not only the soot in smoke that does harm, but the invisible gases and fumes. A recent contribution to these fumes is the exhaust from automobiles. Then the street tree is lucky if it has nine square feet of soil around it that is not paved. The pavement prevents aeration of the soil, keeps away water, and above all prevents any of the natural food supplied by the decaying leaves from returning to the soil. To a less extent, yard and park trees suffer from the same difficulties. They breathe the same smoke-laden air, and while park and yard are not paved the grass is cut away and the leaves raked up and removed, and the soil will usually be found to be hard, dry and lacking the necessary foods for vigorous tree growth.

Street, yard and park trees suffer from many specific diseases and also from injuries, but these are unimportant compared with the malnutrition which results from lack of the natural food supplied under forest conditions by the falling leaves. In the case of park and yard trees, this difficulty can be met to some extent by fertilizing the ground, but the conditions under which street trees live are so severe that the best way to meet the problem is to plant only trees that are hardy and smoke-resistant. The sycamore is a typical example of this type and will probably be planted increasingly as time goes on.

In dealing with trees in the yard and park, always look ahead twenty-five years. If a tree is obviously declining and has only a few years to live, it is far better to cut it down and replace it with a young and vigorous tree, unless, of course, it has historic interest or some other special individual value. In yards and parks there should always be understudy trees growing up ready to take the place of the older trees. It takes time to grow trees.

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PHYSICS

New Relay Most Sensitive

Mechanical window displays that automatically start to operate when a person stops to watch, lights of a city that may be turned on by a single drop of rain, or costly jewels, loosely laid around and apparently unprotected, but arranged so that a bell rings loudly when a prospective crook's hand draws near, are now a possibility as the result of a new electric relay. The device was invented by D. D. Knowles, research engineer of the Westinghouse Electric and Manufacturing Company.

It is known as the Knowles grid-glow relay, and resembles a radio set vacuum tube in appearance. When properly connected, a billionth of a watt of electrical energy, about one-fortieth the amount of energy exerted by a fly climbing an inch in a second, is sufficient to control the flow of a current a hundred million times as great, and this current, in opening or closing another relay, can control currents as high as twenty-five amperes, as much as used to operate large motors.

Though exhausted of air, the tube contains neon, argon, or some similar gas which is chemically inert. Like a radio tube, the parts within are an anode, a cathode and a grid, but there is no filament. When the anode and cathode are connected to the two terminals of a circuit of about 440 volts, no current flows, because there is an electrical charge built up on the grid which blocks it, as long as the grid is insulated. But if the grid be connected to the ground, the blockade is lifted, and the current flows, and operates any device connected in the circuit.

In the demonstration made showing how jewelry may be protected, a watch was laid on a plush cover under which was a piece of tinfoil connected to the grid of the relay tube. As soon as the hand was brought near the watch, and the tinfoil, the electrical charge on the grid is removed. The tiny amount of electrical energy jumps from the tinfoil to the hand. The grid being discharged, the 440-volt current flowed through the tube, and operated any device in the circuit. A drop of water falling on two fine wires, a photoelectric cell sensitive to light variations, or a flame under two parallel wires, were substituted for the hand and tinfoil arrangement. Possible applications of the device suggested by Mr. Knowles are to guard exhibits in stores and museums, turn lights on and off at nightfall and daybreak, warn of thunderstorms and give alarms when intruders enter doorways or halls.

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CERAMICS

Chinese Art Languishing

Though chinaware and porcelain comprise one of China's gifts to the world, this famous industry has languished since the beginning of the Republic, according to "China, a Commercial and Industrial Handbook," just issued by the U. S. Department of Commerce.

The patronage of the emperors did much to encourage manufacturers who took personal pride in the production of their porcelains but unfortunately without the stimulus of imperial interest, the industry seems to have slumped and shows great lack of enterprise. There were several imperial potteries under the old regime, the chief of which has been located at Kingtehchen in the Kiangsi Province since 200 A.D.

Exceedingly beautiful china is still made, according to Commercial Attache Julean Arnold, but it is difficult for tourists to make satisfactory purchases owing to the limited supply of pieces kept on hand. China posseses not only the skilled potters but plenty of raw material in the shape of high quality kaolins and clays, so that when the political order of the country becomes more stabilized, it is sure to become again an important factor in the ceramic industries.

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It is believed that the rate of reproduction of some simple-celled living creatures is dependent upon the wave lengths of light they receive.

PHOTOGRAPHS OF SCIENTISTS

Science Service has a collection of nearly 2,000 photographs of scientists throughout the world. The tenth installment of this list is published below. Although this list has been checked with care, corrections are requested, since a complete catalog will be issued later. Photographs of scientists not listed are desired.

For the convenience of teachers and scientific enthusiasts, these photographs are offered for sale. Any ten photographs (each postcard size 3⅛ x5⅜ inches) will be sent postpaid for only $2.00. Enlargements, 8 x 10 inches, are $1.00 each postpaid. Postcard pictures are finished only in black and white, but enlargements are offered either in black and white or sepia on buff stock. Please specify which.

Starred (*) photographs can be furnished as $1.00 enlargements only. Photographs at these prices are sold with the understanding that they are not to be used for publication.

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10090* Peters, J. F., Elec. Eng., Westinghouse Elec. & Mfg. Co.
1356 Peterson, Grace A., Mycology, Cornell University
10098* Petit, Gabriel, Veterinary School, France
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Noise and Nerves

(*Continued from page 222*)

which accumulated each day beside Miss Keller's machine, there was no difference in the number of errors made, whether the room was full of echoing sounds or whether the sounds were deadened. This may explain why the typist herself thought she was not being disturbed by the noises. But Dr. Laird's figures show that the typist was keeping up her accuracy at the expense of speed and only by an increasing drain on her energy.

When the really noisy conditions were in full swing, the energy demand quickly mounted 20 per cent higher than it had been with the vibrations deadened. And as the experiment progressed the drain on the typist's energy increased as she tried to overcome the bombardment of echoes from the brick walls.

This energy output was measured, Dr. Laird explained, by analyzing the typist's breath. The gas mask into which she breathed carried the breath out through a long tube into the next room, where it was measured in a gas meter. Every fifteen minutes a laboratory assistant examined the air sent through the tube and reported the percentages of oxygen and carbon dioxide it contained. From this the greater energy output in the noisy room was shown.

The psychologist's stop watch showed equally marked contrasts in the typist's speed. In quiet conditions, her speed steadily increased for two hours, it was found. But in noisy conditions, her speed fell off after about 45 minutes.

Even the time taken to slip a new sheet of paper in the typewriter increases when a room is full of noise and confusion, Dr. Laird's tests indicate. And if accuracy is kept up, as Miss Keller kept it up by considerable skill at concentration, the mental effort causes fatigue to set in rapidly.

On the second morning of typing in the noisy room, this speed typist, who is used to working under stresses and strains, became exhausted before the test period was up and had to be helped out of the room by an assistant. Yet she went back later, and Dr. Laird pronounced that she stood up well under the experiment.

On the last day of the test, the noise machine was turned off, and the typist worked in an absolutely quiet room. Results of this day's work did not differ appreciably from the results in the room with covered walls, Dr. Laird found.

This may indicate that some noise is not harmful to the individual's efficiency or physical condition, he suggests.

It might be said that this is only one individual, and that other people may be affected differently, or not at all. But Dr. Laird points out that somewhat similar tests which he has recently made with typists of average ability show the same general tendencies. Some, who had less power of concentration than the speed typist, ran up a high record for making mistakes when the telephone bells and the phonograph filled the brick-walled room. All of the "just average" typists lost speed, and most of them spent about 35 per cent more energy in fighting the noise.

From such experiments and from experiments of other scientists, Dr. Laird concludes that "in general, the better typist the more she is adversely affected by noise; amateur typists in such tests have not been measurably bothered by noisy surroundings."

Other psychologists have been struck by the importance of the same problem of what noise can do to fingers at work or to a brain that is trying to struggle with an idea.

Dr. Linus W. Kline, working in the Harvard psychological laboratory, tied tin cans together and dragged them back and forth across a room, while obliging students helping him with the experiment tried to concentrate on mental problems. The noise of the tin cans, the professor found, interfered appreciably with the students' progress in learning.

Another psychologist, Dr. John J. B. Morgan, working at Columbia University, rigged up a typewriter, so that the amount of pressure on the keys was recorded. While students typed he ran off a Noah's Ark phonograph record, and found that the animal sounds bothered the typists and caused them to use up more energy and exert more pressure on the keys.

It has long been realized that coppersmiths, kettlesmiths, and railroad engineers, who work all day to the accompaniment of loud noises, are apt to become gradually deafened. It is a newer idea that ears are sufficiently sensitive so that they show greater signs of fatigue after an ordinary individual's working day or at the end of the week. But this was recently demonstrated by four scientists at the University of Wisconsin, using for their apparatus only a watch mounted on a moving carriage. The distance

(*Just turn the page*)

PHYSICS

"Sick" Electric Lamps

That a "disease" of electric lamps, due not to microbe, but a combined physical and chemical phenomenon, may be the clue to some diseased conditions of men and animals, is the suggestion thrown out by Sir Oliver Lodge, famous British scientist, in the magazine *Nature*.

The lamp filament "disease," he says, was called to his attention by Dr. C. C. Paterson, director of the General Electric Research Laboratories in England. Its effect is to thin the filament in one place and thicken it in another, which causes the lamp to burn out to an untimely death.

A minute amount of water vabor in the lamp is the poison that causes the effect. Water, whether in liquid or vapor form, consists of hydrogen and oxygen. Inside the electric lamp, the heat of the filament causes the molecules of water to break up into atoms of hydrogen and oxygen. The free oxygen combines with some of the tungsten of the filament to form tungsten oxide, just as oxygen in the air combines with iron to form iron oxide, or iron rust.

But when a molecule of tungsten "rust" is formed, it is soon deposited on another part of the filament, slightly cooler than the part from whence it came.

In the cooler parts of the filament, the free hydrogen atoms pull the oxygen out of the tungsten oxide, and the tungsten is left on the filament in a different place from where it started. Then the water molecule, formed of the reunited hydrogen and oxygen atoms, is free to return to the thin part of the filament to take away some more tungsten. The thin part becomes still thinner, the resistance to the current becomes greater, and this part of the filament becomes hotter, and the action is speeded up.

As the action is due to water vapor, the obvious remedy is to make sure that no water vapor is left in the bulb. Sir Oliver suggests that some similar impurity might be present in the blood or tissues which may act in such a way in building up local growths at the expense of other parts of the body. He commends this to the attention of biologists and points out that salt solutions, and liquids similar to those in the body, are known to behave in a very similar way to gases.

Science News-Letter, April 9, 1927

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Noise and Nerves

(*Continued from page 227*)

at which the students could hear the watch tick at different times was measured, and they found that mental work always causes decrease in keenness of hearing, and strenuous physical exertion has the same temporary effect.

These scientists reported that the ears are a delicate barometer of physical fitness. In other words, diminished hearing power may give warning of approaching fatigue several hours before the individual's muscles and nerves tell his brain that he is becoming weary.

Even in sleep the ears are on guard. Dr. Laird states that the passing of a noisy trolley car or automobile beneath your bedroom window raises your blood pressure at once, though no signs of wakening may be noted.

All this does not mean that ears are so fragile that they should be protected against every loud noise and every distracting sound. It does mean that noise may be a factor in efficiency, in office and shop efficiency, and in personal efficiency as well.

Results of such tests as Dr. Laird is making are causing executives to look over their plants and offices to see whether excessive noise is making their employees inefficient, weary, and perhaps impairing their hearing. Machinery that once rocked an entire building is being put on bases which will cut down vibrations, and instead of the vibrations being prolonged, they fade away quickly. Walls and floors are being made sound absorbent, to swallow up the echoes of a battery of machine-gun typewriters. And employers are finding out how many people can, or cannot, work together effectively in a given space.

Much attention has been paid recently to providing adequate lighting conditions in offices, factories, and homes in order to conserve eyesight. Ear strain has been equally neglected, but a growing interest in the subject of saving ears indicates that perhaps, after all, city dwellers are not going to be content to grow comfortably deaf in a noisy world.

Science News-Letter, April 9, 1927

Minnesota farmers living along a trunk line railway left eight rows of corn standing to prevent snow drifts.

A group of naturalists is urging that birds of prey have good qualities and should not be slaughtered at the present rate.

More Eyes and Ears---

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MEDICINE

Lister Memory Honored

This spring medical men everywhere, and throughout Great Britain and the United States in particular, will commemorate the centenary of Lord Lister, the man who laid the cornerstone of modern surgery.

During the week of July 15-23 British medical men will hold a celebration in conjunction with the 95th annual meeting of the British Medical Association, which will be attended by representatives from American institutions as well.

When a man dabs iodine on a specimen of facial razor carving and when mother washes a gash in Johnny's leg with a solution of phenol, they are paying unconscious tributes to the shade of the great English surgeon.

Joseph Lister was born on April 5, 1827, at Upton in the county of Essex. He received his medical training at London and Edinburgh and in 1860 became professor of surgery at the University of Glasgow, where most of his greatest contributions to science were made.

Great as were the possibilities opened up by the use of anesthetics in the middle of the nineteenth century, the battle of surgery was only half won. In spite of every precaution wounds would become infected and hospital records of amputations show that sometimes as many as forty-five per cent. of the cases with such operations would die. While studying the prevalence of such surgical pests as septicemia, tetanus, and the hundred and one pus infections that open wounds are heir to, Lister came across some of the work of Pasteur. Immediately grasping the explanation that such infections were caused by the then almost unheard of organisms called bacteria, he set out straightway to find a way to destroy the microorganisms in wounds that would not harm the body tissues. The heat sterilization recommended by Pasteur in his work in those pioneer days of bacteriology was not applicable here, so Lister turned to chemicals. After trying out several he lighted on carbolic acid, possessed of germ killing properties but not strong enough to injure the flesh of the wound.

His theory worked and, in spite of the criticism almost invariably heaped upon any new method at first, modern surgery is based on his idea of keeping wounds free from sepsis. To quote the Journal of the Medical Association, "The triumphs of antiseptic and aseptic surgery are the renewed reminders and the lasting monuments of the great achievements of the British surgeon."

He was the first medical man to be raised to the peerage and shares with Pasteur the rare distinction of having received general popular acclaim and appreciation in a degree seldom accorded to workers in any field of science.

Science News-Letter, April 9, 1927

MINERALOGY

Record Borax Deposit

The discovery of some eight million tons of an entirely new mineral all in one huge deposit in Kern County, Calif., has set a record in modern mineralogy. The mineral is "rasorite" named after its discoverer, C. M. Rasor, leading borax engineer of the Mohave desert field. While new minerals in small quantities turn up once in a while in various parts of the world, it is unusual for so vast a quantity of an entirely new natural chemical substance, and a valuable ore at that, to be so long overlooked.

Rasorite is known to chemists as the tetrahydrate of borax. As freshly mined, it emerges in striated crystalline bars of glassy texture, some as large as common stovewood. It requires only a recrystallization with an added quantity of water to yield commercial borax, whereas all other important borax ores such as colemanite and ulexite require expensive chemical processes with resulting high prices of the product.

According to chemical theory, the natural rasorite is a substance which cannot be produced under the ordinary atmospheric pressure of fifteen pounds to the square inch, and thus had never been observed either in formations on the surface of the earth or in the synthetic laboratory. Great pressure due to an over-layer of lime borate and desert sediment has permitted the formation of the unique compound far below the surface of the Mohave desert. The deposit is located almost on the Kern-San Bernardino county line a few miles northwest of Kramer, Calif., and thus near the transcontinental line of the Santa Fe to San Francisco. The supply in sight is enough to meet the needs of the United States for over fifty years at the present rate of consumption.

The market price of borax, already sagging from keen competition among California and Nevada corporations, seems to be headed decidedly downward as the new branch railway line to the rasorite mines nears completion. Borax is used extensively in enamels, welding fluxes, laundry materials, etc., but its application in the almost unbreakable borosilicate glass promises the most conspicuous new benefits. At present a few bottles, pitchers, baking dishes and other vessels of this glass are marketed at high prices, but if borax, the critical ingredient, should go below forty dollars a ton there will likely be a much wider use of the new glass. Borosilicate glass, composed largely of sand and borax, expands but slightly on heating and thus will stand boiling water and even oven temperatures without cracking.

As now constituted, fruit jars and milk bottles offer a fertile field for improvement. Unfortunately, the manufacturers of bottles will have to be shown why they should make an unbreakable bottle and thus have no opportunity to sell replacements. The dairyman passes on the responsibility for cracked glassware to his deliveryman and customers, and so he has not yet become excited about the matter. However, the casualty list on bottles is enormous, taken the country over, somebody has to pay the bill, and if the consumers' demand for stronger bottles becomes insistent enough they will doubtles be made.

Science News-Letter, April 9, 1927

SOCIOLOGY

Politics Cause Prison Chaos

"Politics more than anything else is responsible for our incoherent, ineffective, chaotic prison system in the United States today," declares Austin H. MacCormick of Bowdoin College. "For one reason or another there is not one prison in America today that is doing a well-rounded, thoroughgoing piece of work in the reclamation of human material. Some of them never will until short-sighted legislatures give them the necessary tools to work with; most of them will not until their wardens and boards of control are selected without regard for politics."

Whether there is a connection between the great increase in burglary crimes and the present methods of writing burglary insurance has been inquired into by Dr. E. B. Crooks, of the University of Delaware. The desire of many insurance companies to write large amounts of business causes them to insure property that is not adequately protected against theft by the owner, he says.

Science News-Letter, April 9, 1927

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Especial attention is given to the world-wide activities of the Commission on Intellectual Cooperation and, especially, to *Le Centre de Synthése*, one of the foundations closely cooperating with the work of that Commission.

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BIOLOGY

NATURE RAMBLINGS

By FRANK THONE

Beavers Again

Once more the beavers are coming out of winter quarters and giving their home ponds their spring going-over. Mischief done to the dam must be repaired first, of course, as well as any damages sustained by the series of little auxiliary dams.

Beaver cleverness at felling trees, and beaver intelligence in constructing hydraulic works, have been somewhat over-rated. It is not true, for instance, that a beaver always cuts a tree to fall just where he wants it. Beaver trees fall away from the stream as often as they fall toward it, and very frequently they lodge in the tops of neighboring trees where they cannot be of any use at all, though there may have been plenty of free space all around. Similarly, beavers often build canals clear through the woods and out into open wet meadows beyond them, where there is no wood to be floated to their ponds.

So different are the habits of the beaver from those of most of his relatives that it is with something of a start that we realize he is a rodent, close kin to the rabbit and the rat. But a glance at the build of his head tells the whole story. Its whole structure is centered around his powerful, chisel-like front teeth, about the most efficient gnawing equipment owned by anything that wears fur. And gnawing is the one performance that is most strongly characteristic of rodents.

The beaver played a large part in the development of America. It may even be said that the beaver hat played a large part in that development. Beaver hats were fashionable a little over a century ago, and beaver trappers pushed their operations far out into the newly acquired Louisiana Purchase, exploring every valley and pass in the West in their search for the elusive animals that bore this costly fur. Some of the most valuable members of the Lewis and Clarke expedition were of this tribe of Nimrods of the beaver.

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MEDICINE

Find Parent Of Vitamin D

The anti-rachitic vitamin over which dieticians, health authorities and the possessors of young offspring have been so deeply concerned for the last few years, is nearly tracked down to its original source. The younger generation will be interested to know that a preparation many times more potent than cod liver oil to prevent and cure rickets is ready to be tried out by physicians.

Scientists in America and Europe working in more or less collaboration on the problem, have come to the same conclusion, says Dr. Alfred F. Hess, of the College of Physicians and Surgeons at Columbia University, that the anti-rachitic vitamin D is formed when certain sterols, a group of substances similar to fats, widely distributed in the lower plants, are exposed to ultra-violet light. Both Dr. Hess and Drs. O. Rosenheim and T. A. Webster, of the National Institute for Medical Research in London, have collaborated with Prof. A. Windaus of Göttingen University in Germany, who has been engaged in research on the chemical problems involved in the isolation of the anti-rachitic vitamin, for several years.

About two years ago, Dr. Hess reported that cholesterol, occurring in all animal fats and oils, and its counterpart, phytosterol in vegetable foods, after irradiation with ultra-violet light, was the substance actually responsible for preventing rickets. Irradiated cholesterol in very much smaller doses would produce the same results as cod liver oil, only one millionth of a gram being necessary to protect a rat from rickets.

Now, however, another step in the pursuit of the vitamin, has been accomplished. The English workers, Dr. Hess, and Professor Windaus of Göttingen, all believe that it is only a small portion of the cholesterol which is activated by ultra-violet light. This is an allied substance called ergosterol. This compound is widely distributed in lower plant forms and only very minute quantities are needed to protect laboratory animals from rickets.

"It was found," says Dr. Hess, "to bring about a healing process of the bones when even as little as .0003 mg. per capita daily was given. In tests in which irradiated cholesterol is fed, it has been found that approximately 1 mg. is needed to initiate healing. Other experiments will be undertaken to ascertain the relationship of ergosterol to cholesterol and the extent of its distribution in the animal body."

The practical value of the discovery of this concentrated form lies in the fact that it will be possible now to dispense with the malodorous and nauseating cod liver oil. Hitherto it has been the practice to resort to such general remedies as sunlight and a diet of foods known to contain anti-rachitic elements. A German authority has suggested that one of the consequences of this research will be to put oleomargarine products on an equal basis with butter and cream, for the irradiated oleo will have the same anti-rachitic constituents as real butter.

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PHARMACOLOGY

Insulin Action Duplicated

A synthetic drug that acts like insulin in remedying diabetic conditions, but which can be taken by mouth instead of necessitating troublesome daily injections with a hypodermic needle, is the discovery reported by Dr. E. Frank of the University of Breslau.

The new compound is a derivative of guanidin, a substance long well known to organic chemists, and has been named "synthalin" by its discoverer. It is not nearly so powerful as insulin in the crystalline form, first prepared by Dr. John J. Abel of the Johns Hopkins University, but its effects are indistinguishable from those of the natural drug produced from the pancreatic gland. Injected into the blood stream of laboratory animals afflicted with diabetes, it quickly reduces their blood sugar concentration to normal, and an overdose produces the convulsions that are a symptom of excessive insulin. These convulsions can be cured by injecting sugar solution, as they are in the case of those produced by the natural insulin.

Dr. Frank states that the new chemical will be of use chiefly in the treatment of mild and moderately severe cases of diabetes, and he cautions prospective users to be exceedingly careful in regulating the size of the dose. Synthalin alone, he says, will not avail against diabetes in its more advanced stages. In these the frequent injection of insulin is still the only effective treatment. But even here, he claims, synthalin will be useful as an auxiliary medicament, for by swallowing properly adjusted doses of it the patient can cut the number of insulin injections needed daily from three down to one.

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First Glances at New Books

TOWARDS THE OPEN: A PREFACE TO SCIENTIFIC HUMANISM—Henry Chester Tracy, with an introduction by Julian Huxley—*Dutton* ($3.50). A highly significant book this, the significance being about equally divided between the title and the sub-title. The "Open" referred to is the great world of nature, plotted and titled by man or not as the case may be, plus the human soul undulled in its response thereto.

The humanism advocated is to be made scientific by making this response both rationally critical and emotionally sensitive.

A sort of partnership between science and art for the understanding and appreciation of nature and for using nature to man's well-being seems to be what the author aims at. And the aim is the more significant from being conceived and set forth with unmistakable literary excellence by one trained scientist and endorsed by another such scientist.

Much penetrating comment on various phases of American culture believed by the author to be contributing meagerly indeed toward the ends he holds desirable merits careful reading by many people.

William E. Ritter.

Science News-Letter, April 9, 1927

THE ROMANCE OF THE ATOM—Benjamin Harrow—*Boni & Liveright* ($1.50). Old and new theories of the structure of matter written for the layman.

Science News-Letter, April 9, 1927

THE MIGRATION OF BIRDS—Alexander Wetmore—*Harvard University Press* ($2.50). A valuable assemblage in one book of widely scattered facts about bird migration to which the writer has added significant data from his own observation.

Science News-Letter, April 9, 1927

FOUR THOUSAND YEARS OF PHARMACY—Charles H. LaWall—*Lippincott* ($5). A readable and comprehensive history of the use of drugs in remedying human ills, ornamented with reproductions of illustrations from early books on pharmacy in the author's library.

Science News-Letter, April 9, 1927

THE CONQUEST OF DISEASE—Thurman B. Rice—*Macmillan* ($4.50). Books like this should have a place in every family's medicine cabinet. Intelligent absorption of its contents will do more good than many a bottle.

Science News-Letter, April 9, 1927

PHOTOSYNTHESIS—H. A. Spoehr—*Chemical Catalog Co.* ($6.50). All life on this planet is dependent on one set of chemical reactions, which only the green plant, with the aid of radiant energy from the sun, can accomplish. The attention given by chemists and physiologists to the problems presented by this fact is commensurate with its importance; regrettably, the completeness of our understanding of it is not yet commensurate with the effort bestowed. Nevertheless, progress, fairly rapid in spots, is being made. Dr. Spoehr places all science, and especially chemistry and physiology, in his debt by assembling into one concise and comprehensive volume all known facts about photosynthesis, including those brought forth by his own penetrating research. No director of advanced study in organic or physiological chemistry or in plant physiology can pretend to be doing justice to his students or to his own investigations unless he has this book among the "ten most indispensables" on his reference shelf.

Science News-Letter, April 9, 1927

NUTRITION WORK WITH CHILDREN—Lydia J. Roberts—*University of Chicago Press* ($3.50). Presents the problem of malnutrition as it affects childhood together with practical methods for its eradication. Designed as text book for students of dietetics in universities and colleges.

Science News-Letter, April 9, 1927

A GUIDE TO THINKING: A Beginner's Book in Logic—Olin Templin and Anna McCracken—*Doubleday, Page.* To teach young people (and perhaps older ones, if possible) the technique of thinking, is the aim of this well organized and clearly written text on logic. The necessary abstractions of the subject are made less formidable by numerous exercises and examples.

Science News-Letter, April 9, 1927

LEGAL PSYCHOLOGY — M. Ralph Brown — *Bobbs-Merrill.* The part which the new science of psychology is prepared to play in assisting the old science of law is told in readable style. The chapters in which Mr. Brown analyzes the mechanics of court room procedure provide convincing evidence that both introspective and objective psychology can scarcely be kept out of the court room, even though some ultra-conservative jurists continue to "object" to its introduction there.

Science News-Letter, April 9, 1927

GEOGRAPHY

Minerals Enter Politics

Quotation from MODERN BUSINESS GEOGRAPHY—Ellsworth Huntington and Sumner W. Cushing—World Book Co.

The possession of mineral deposits by a country is partly a matter of chance and partly a matter of political foresight. It is fortunate for the United States that its northern boundary was so run that it includes some of the richest of the world's iron deposits; but since at that time no one knew the value of the minerals near the head of Lake Superior, credit for giving the deposits to this country must go to mere luck. On the other hand, it was not luck that gave Alaska to the United States; it was the political foresight of Secretary Seward. For two cents an acre he bought a vast region which up to 1920 had yielded more than $2.50 per acre, chiefly in gold. Today every advanced country is eager to obtain either political or commercial control of places that furnish any sort of mineral wealth, but especially coal and petroleum. This eagerness has been a cause of political troubles in Mesopotamia, Manchuria, Mexico, Spitzbergen, and elsewhere.

Science News-Letter, April 9, 1927

EUGENICS

Eugenics and Race

Quotation from THE RACIAL BASIS OF CIVILIZATION—Frank H. Hankins Knopf—The author is professor of sociology in Smith College.

There can in fact be no doubt of individual variations; there are superior and inferior strains in every race, nation, class or community. This is a general biological fact of the widest application. But such variations would exist and be equally important whether races are equal or unequal to one another. If we assume the races to be equal the aims of a sound eugenics are in no way affected. It would still be desirable to prevent differential rates of reproduction from lowering the average hereditary endowment among any given people. If, on the other hand, we assume the races to be unequal, the eugenic aims and the data for their realization become more complicated, but their importance is neither increased nor decreased.

Science News-Letter, April 9, 1927

There are few gaily colored flowers in the regions where nectar and pollen gathering insects are scarce.

The male black bass stays on its watery nest of fish eggs during the entire incubation period.

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Anniversaries of Science

April 23, 1858—Birth of Max Planck, author of "quantum theory" of radiation.

It is difficult to formulate the quantum theory accurately within the compass of a nutshell, and in fact it is still not quite certain just what its kernel consists of. This much at any rate seems certain, that in the interactions between radiation and matter which result in the transference of energy from the radiant to the material form or vice versa there are processes which take place discontinuously and are incapable of description in mechanical terms. . . . The dynamically possible systems are restricted to those for which twice the value of the integral of the kinetic energy with respect to the time taken over a complete period is equal to an integral number n times a universal constant h, known as Planck's constant. Ordinary dynamics lays no such restriction on the motions which are possible.

—O. W. Richardson: Physics in *Problems of Modern Science.*

April 24, 1800—Sir William Herschel announced to the Royal Society his experimental procedure first demonstrating the presence of the infra-red spectrum. If a beam of sunlight is resolved by a prism into a visible and invisible rainbow, the blackened bulb of a thermometer placed in the region beyond the red part of the spectrum registers a rise in temperature. This Herschel observed and wrote:

. . . . if we call light, those rays which illuminate objects, and radiant heat, those which heat bodies, it may be inquired, whether light be essentially different from radiant heat? In answer to which I would suggest, that we are not allowed, by the rules of philosophizing, to admit two different causes to explain certain effects, if they may be accounted for by one. A beam of radiant heat, emanating from the sun, consists of rays that are differently refrangible. The range of their extent, when dispersed by a prism, begins at violet-colored light, where they are most refracted, and have the least efficacy. We have traced these calorific rays throughout the whole extent of the prismatic spectrum: and found their power increasing, while their refrangibility was lessened, as far as to the confines of red-colored light. But their diminishing refrangibility, and increasing power, did not stop here: for we have pursued them a considerable way beyond the prismatic spectrum, into an invisible state, still exerting their increasing energy, with a decrease of refrangibility up to the maximum of their power; and have also traced them to that state where, though still less refracted, their energy, on account, we may suppose, of their now failing density, decreased pretty fast; after which the invisible thermometrical spectrum, if I may so call it, soon vanished. . . . .

If this be a true account of solar heat, for the support of which I appeal to my experiments, it remains only for us to admit, that such of the rays of the sun as have the refrangibility of those which are contained in the prismatic spectrum, by the construction of the organs of sight, are admitted, under the appearance of light and colors; and that the rest, being stopped in the coats and humors of the eye, act upon them, as they are known to do upon all the other parts of our body, by occasioning a sensation of heat.

—Sir William Herschel: *Philosophical Transactions of the Royal Society.*

Science News-Letter, April 9, 1927

PHYSIOLOGY

The Imperious Intestine

This week's prize winning poem in the Science Service scientific poetry contest.

(If the salt strength as a whole differs from that normally in the small intestine at rest, the intestine will promptly reject the mixture back into the stomach until it is of the right concentration)—Science News-Letter, February 26, 1927, p. 135.)

Ye gods; who now is sleeping on the job
That this unsalted chyme is sent my way!
After long hours of waiting for my chyle,
Who thinks I'll take this tasteless, sickish whey?
My million villi babes refuse to taste
The vapid pap, and will not suck it down;
They scream and writhe, 'till I am quite distraught,
Nor can my songs their wilder wailings drown.
You stupid Stomach, churning endlessly!
You concrete-mixer, keep your nauseous mess!
Your rennin and your pepsin can not help;
Call up that ostrich neck, Oesophagus,
And rouse the lazy taste-buds of the tongue,
Those at the front, and order us more salt,
Not ptyalin nor bitter, sweet nor sour,
We've traced it front, and theirs is all the fault.

Tell them to hurry, or in spite of bile
And pancreatic juice, I'll fling the whole
Back through the duodenum-hallway door,
And fill you mixers with the nasty dole!
Then you will ache and sicken, but no odds;
Your lazy carelessness is all to blame;
A billion body-cells cry out for food,
And sleeping sentries are an army's shame.

"More salt! More salt!" my million villi cry.
More salt, you stupid Tongue! More salt, you Bag!
Send me more salt or in an instant more
I'll choke you both with this unsavory gag!

—*Ethel E. Griffith.*

Science News-Letter, April 9, 1927

PSYCHOLOGY

Feeling Speech Aids Deaf

Feeling speech through the skin will enormously speed up the slow process of educating deaf children, is the prophecy made by Dr. Robert H. Gault, of Northwestern University, who spoke recently at the Franklin Institute.

For four years Dr. Gault has been doing pioneer work under the auspices of the National Research Council to determine whether the skin is sufficiently sensitive for deaf people to distinguish sounds vibrating against their fingers. In his experiments, words spoken by one individual are amplified by electrical apparatus and transmitted to a vibrator which the deaf person holds in his hand. Each sound that makes up speech has its own characteristic vibration which the deaf person learns to know by touch.

"Two deaf people who worked in my laboratory a little less than 300 hours were able to pick up a story from the feel of it when the speaker was out of sight," said Dr. Gault. "This is no more uncanny than is learning to know any other thing in the dark by its feel."

When the deaf person watches the lips of the speaker and at the same time feels the speech vibrations, he can understand what the speaker says from 30 per cent. to 100 per cent. better than he can when he depends entirely on reading the lips, Dr. Gault has found. Since lip-reading is now a standard method of teaching the deaf to understand speech, he believes that the sense of touch can be used to great advantage in these schools to make lip-reading more effective.

Science News-Letter, April 9, 1927

ARCHÆOLOGY

Home Brew In Babylon

Brewing beer was a respectable household task among families along the Tigris and Euphrates Rivers 9000 years ago. Evidence of this high antiquity of the craft of brewing and its place in ancient social systems of Babylonia and Egypt has been traced by German scientists of the Society of History and Bibliography of Brewing.

There were laws about drinking in those days, the report shows. Certain rations of beer were allowed to each class of workers. Beer was also used in mixing medicines, and as an offering to the gods. Brewing was an organized business as early as 5000 B. C., it is stated.

Science News-Letter, April 9, 1927

The Years Have Taught Us

that only through the development of science does a nation, a profession, an industry progress. Science Service was established that the layman might know the world of science and its daily advancement. Science is not remote—the problems with which the inventor and discoverer contend are close at hand. Know step by step the way the men of science work to attain their objectives.

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